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a mild form of the American phenomenon of the same name. It occurred at North Sydney, March 27 last, in the region of northeast cyclonic winds, and moved southeast. This is the region which corresponds to the usual part of a cyclonic area in which our tornadoes occur.

BÖRNSTEIN'S 'LEITFADEN DER WETTERKUNDE.'

ONE of the most useful text-books of recent years is Börnstein's 'Leitfaden der Wetterkunde,' the first edition of which was published in 1901. This excellent little volume has now come to a second edition (Berlin, 1906), and has been brought thoroughly up to date. It in no way trespasses on the ground covered by any other of the newer text-books, and is unique in presenting an extraordinary richness of material, in a clear, compact form, with an admirable list of references to publications where further details may be sought. In the new edition special attention is paid to the temperature conditions and movements of the upper air, and to other subjects upon which recent studies have thrown much light. We note an interesting view (Fig. 14) of the upper surface of a sea of clouds, in which the course of underlying rivers is indicated by breaks; the inclusion of Berson's excellent classification of the different atmospheric strata in relation to vertical temperature gradients (p. 35); and the beautiful colored cloud views, Pls. V.-XV.

THE CYCLONIC THEORY.

W. H. DINES, who has been active in the prosecution of kite meteorology, says (*Nature*, 1906, 35-36) that the results of some two hundred kite ascents which he has carried out in England and Scotland, with an average height of about one mile, seem to give no evidence either for or against the convectional or 'driven' theory of cyclones. Dines believes that an error has been made in working out the results of free-air observations in cyclones and anticyclones. In a gas in equilibrium, he says, under a conservative system of forces, the isothermal and isobaric surfaces must be identical. The temperatures in cyclones and anticyclones should, therefore, not be com-

pared at the same height, but on the same isobaric surfaces. In temperate latitudes these surfaces may differ from surfaces of equal height above sea level by a thousand or more feet.

'SOME FACTS ABOUT THE WEATHER.'

UNDER the above title, Mr. William Marriott, assistant secretary of the Royal Meteorological Society (London), has published a little handbook of thirty-two octavo pages, at the price of sixpence (London, Stanford, 1906). The text covers about the ground of a 'popular' lecture on meteorology, but is especially adapted for use in the British Isles.

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OUR constant growth in numbers and our recent increase in endowment ought to enable us to do better work in the future than we have done in the past. A progressive university should make the maintenance and improvement of its standards its chief concern. It must be recognized as a place where truth is discovered and taught. I propose to discuss some of the means by which we can reach this end.

In dealing with the question of university organization, we can divide our members into three groups: (1) heads of departments; (2) other instructors and graduate students; (3) undergraduates in the various courses, liberal or professional. This is not the conventional line of division, but it is the one which best serves our present purpose.

Heads of departments ought to be fewer in number, and better paid. This is probably true of American universities as a class; it is certainly true of Yale. We have too many full professors, and, partly as a consequence of this, we pay them too small salaries. If we see a store or factory where there are a large number of more or less separate departments whose heads receive low salaries, we believe that the business is being wrongly administered. It is not always safe to draw too close analogies between industrial work and

<sup>1</sup> From the report of President Hadley.

educational work, but in this case I believe the parallel holds good.

The first step toward reform is to recognize the principle that no man should be appointed to a full professorship in any subject merely because that subject needs to be taught. If there is a man of eminence in the subject who has a genius for discovery or teaching, the fact that such a gap exists creates an additional reason for calling this man to a professorship. But if no such man is to be found the place should be filled by an assistant professor. The fact that we have departed from this principle in the past, and now have on our faculties as full professors a number of men who ought to be only assistant professors, does not alter the necessity for a change of policy in this respect. I am glad to say that nearly all the members of the several faculties of the university cordially accept the principle here laid down, and are willing to try in future to appoint none but a first-class man to a grade higher than an assistant professor, even though this policy may for the moment apparently weaken the strength of our teaching force. This weakening will be apparent rather than real. There is nothing which really weakens the teaching force so much as the permanent appointment of a man of the wrong type, who lowers the standard held before the students and blocks promotion among the younger instructors. It is far better to have a subject taught by ambitious young men who see an opening ahead than by a somewhat older man who has little to recommend him except his maturity.

With the diminution of numbers, an increase of salaries can follow as a matter of course. This process has already begun, and many of the professors who have hitherto received \$3,750 are now to receive \$4,000. But this should be regarded as only a beginning. Just as soon as the university finances admit it, there should be a further increase to \$4,500, and then to \$5,000 or even \$6,000. There should also be an increase in the number of assistants, who can relieve the professor of the burdensome necessity of reading papers or directing some of the details of individual study.

If a professor is really able and mature, the ideal method is not to give him a division of forty or fifty or sixty, as we used to, with a class-room which would be partly examination and partly lecture, but to let him talk all at once to as many students as possible, be it two hundred or five hundred; and then have these men met as often as once a week in very small groups by a younger instructor, who can talk over the work that they are doing and examine the progress that they are making. Both here and at Harvard this scheme has increased both the teaching efficiency and the financial economy.

We must, however, guard ourselves against the danger of creating a separate or privileged class of research professors. In some universities there is a tendency to set some men apart for discovering new truth, while employing other men to teach old truth. This is a mistaken policy. We are not dealing with an ordinary case of division of labor. The chief argument for division of labor is that it makes each man more expert and more efficient in his own field of work. In university work, however, the man who tries to investigate without teaching is apt to become sterile, while the man who attempts to teach without investigating becomes a worse teacher instead of a better one. We want the opportunities for research and investigation distributed as widely as possible throughout the teaching force and the student body. We want to impress upon every man that teaching and discovery are both done at their best when done in combination. Not that every man should be compelled to lecture to classes, whether he is able to do so or not. There is a great deal of valuable teaching which is not done in the class-room, or even in the laboratory. There are some men who teach best by their writings, their conversations, their intelligent suggestions for the work of others; but they should understand that they are part of the teaching force, and are simply doing their teaching in a different way from other men. Instead of setting such a man apart as a research professor, we should let him understand that withdrawal from the lecture room and relief from the

duties of supervising elementary students carry with them a larger obligation to publish as fully as possible the results of all discoveries; to organize departments intelligently; to train up young men who can teach; and to make liberal room for such men, instead of trying to get in their way when their work becomes popular.

These last statements indicate the policy which we should adopt in dealing with our junior instructors and graduate students. We should give them the maximum of freedom consistent with their teaching duties. We can not, under the existing circumstances, pay them as large salaries as we should like to do, or as the work of many of them deserves; but we can at least give them a fuller chance to show what they have in them. In the time which is necessarily occupied by class-room work we can allow them more independence of method than has been habitual in the past. If we have as heads of departments men who are competent to look after results we can leave their assistants the utmost freedom in the choice of means. We can make a university a good place for an instructor or student of any grade who thinks that he has something to discover. If we keep places free at the top we increase his opportunity for promotion if his discoveries turn out as he expects; and if promotion does not come here we can always find chances for him elsewhere. Of course there will be among the members of the teaching force many a man who disappoints us, and perhaps disappoints himself; but if one of his superiors—president, dean or head professor—gives him timely warning that we shall not be able to promote him here, it is easy to find such a man a teaching place elsewhere without grave hardship to him and with definite advantage to the university.

The success of a system of this kind is to some degree dependent upon the laboratories and library facilities accessible to the different instructors. But a laboratory or library of moderate size, administered in the right spirit, is far more efficient than a much larger one which is monopolized by a few heads of departments for their own special investiga-

tions. It is astonishing what an amount can be done with very moderate facilities by a group of young men working together, animated by the spirit of independent investigation for the moment and by the prospect of distinction for the future. In each new laboratory that we establish, or in each new appointment to the headship of an old laboratory, we set forth clearly the fact that it is to be open to the use of junior instructors and graduate students just as far as the circumstances allow, to work in the way that they think promising rather than in the way that the chief thinks promising. This will result in a good many mistakes, and in some waste which might have been avoided; but it will result in vastly increased efficiency and in a great many discoveries which would otherwise have been prevented.

Mr. Schwab, in his position as head of the library, is fully in sympathy with these ideas; and the addition to the library building, erected from the bequest of William B. Ross, as a memorial to Jared Linsly, is being arranged with that end in view. There is no other institution connected with the university whose administration affects the efficiency of so many departments. Yale is to be congratulated on what Mr. Schwab is accomplishing and also upon the care and intelligence shown by Mr. Haight, the architect of the new building, in enabling us to achieve the most with the means at our disposal.

A committee of the university council is arranging plans for increased opportunities for publication of new discoveries in various lines—a matter in which during recent years our facilities have been inadequate. This is a thing of great importance as a stimulus to the older students and younger instructors. The full professors have so much reputation that they can publish their work anywhere, and proper attention will be given to it; but for the men who still have their reputation to make, the opportunity for a convenient and quick channel of publication is a great stimulus to the work and a great help to the university with which their published work is identified. Nothing in times past did more

for the development of the scientific spirit at Yale than the fact that Silliman's *Journal of Science*, for many years the one high grade American periodical of its kind, was published here. In other lines we have not kept up to the traditions set by Professor Silliman, and have suffered from it rather severely; but it is by no means too late for recovery.

The independence of the different faculties at Yale is in some respects a help, and in other respects a hindrance, to our investigators. It is a help in that it helps to keep alive the traditions of academic freedom. It is a hindrance in that it sometimes prevents the most effective cooperation between the laboratories of different departments.

A thing which is an unmixed help in every way, and should not be overlooked in any discussion of Yale's advantages, is the Graduates' Club. By furnishing a center in which instructors and students of all grades and visitors from abroad meet informally on a plane of social equality, it tends to diffuse the spirit of academic freedom and academic progress. It adds immensely to the attractiveness of New Haven as a place for the ambitious investigator, be he student or instructor, and does more than any other one thing to help the formation of that indefinable thing called a university atmosphere. The Graduates' Club was not organized with this end in view. If it had been, it probably could not have accomplished the result so effectively.

#### SCIENTIFIC RESEARCH.<sup>1</sup>

A COLLEGE, as the word is usually understood in America, is a school of general training. Its work is found to be the more effective the better it is fitted to the traits of the individual, but in the nature of things its work with the individual is not limited to a narrow range of subjects. The university is a school of instruction through investigation. Its characteristics are advanced research and specialized development. As matters are, the faculty of the American university has to deal with two sets of students and two classes of

instruction, those of the college and those of the university. But in both cases it is for the university to set the standard. To the university teacher, individual research is the breath of life, and it is the duty of the institution in every reasonable way to foster its development.

In the practical consideration of this problem we may take the following propositions as granted:

1. A few men, and but a few, even in the greatest universities, ever contribute very much to the direct advancement of science.
2. No one can be a great teacher without the spirit of research; without this he lags behind the progress of knowledge, and his mental equipment becomes second-hand.
3. With most men the practical purpose of research is that they may be better teachers.
4. With most men a reasonable following of students is an aid to research, not a hindrance.
5. Those who feel called to research, but who can not or will not teach, should in general look outside the university for careers, at least until they have clearly proved their eminence.
6. The university should recognize the superior teacher or investigator by relieving him, as far as may be, of administrative drudgery, which uses up time and strength more than teaching does. Every active worker should have what he needs in the way of help of stenographers, artists, readers, curators, mechanics and the like. A man of choice powers should not waste his time on what cheap men can do. It is often best to relieve the ablest men in the department from its executive responsibility.
7. It is desirable that a university should publish the results of completed investigations of its professors, and do this in first-class form. Such publication in worthy manner is a stimulus to good work. But material brought together under stress of demand for publication is best left unprinted.

#### A MEMORIAL TO HERBERT SPENCER.<sup>1</sup>

A SHORT time ago a petition was presented to the Dean of Westminster asking permission

<sup>1</sup>From the annual report of President David Starr Jordan, Stanford University.

<sup>1</sup>From *Nature*.